Run 14 RHIC Machine/Experiments Meeting

1 Apr 2014

Agenda:

- **Run 14 Schedule** (Pile)
- **Machine Status** (Robert-Demolaize)
- **STAR and PHENIX Status** (Experiments)
- **Other**

Call in bridge line is 631-344-8383

Run 14 plan based on 22 weeks cryo operation
and Fischer et.al. RHIC Collider Projections (FY 2013 – FY 2017), 4 Jun 2013
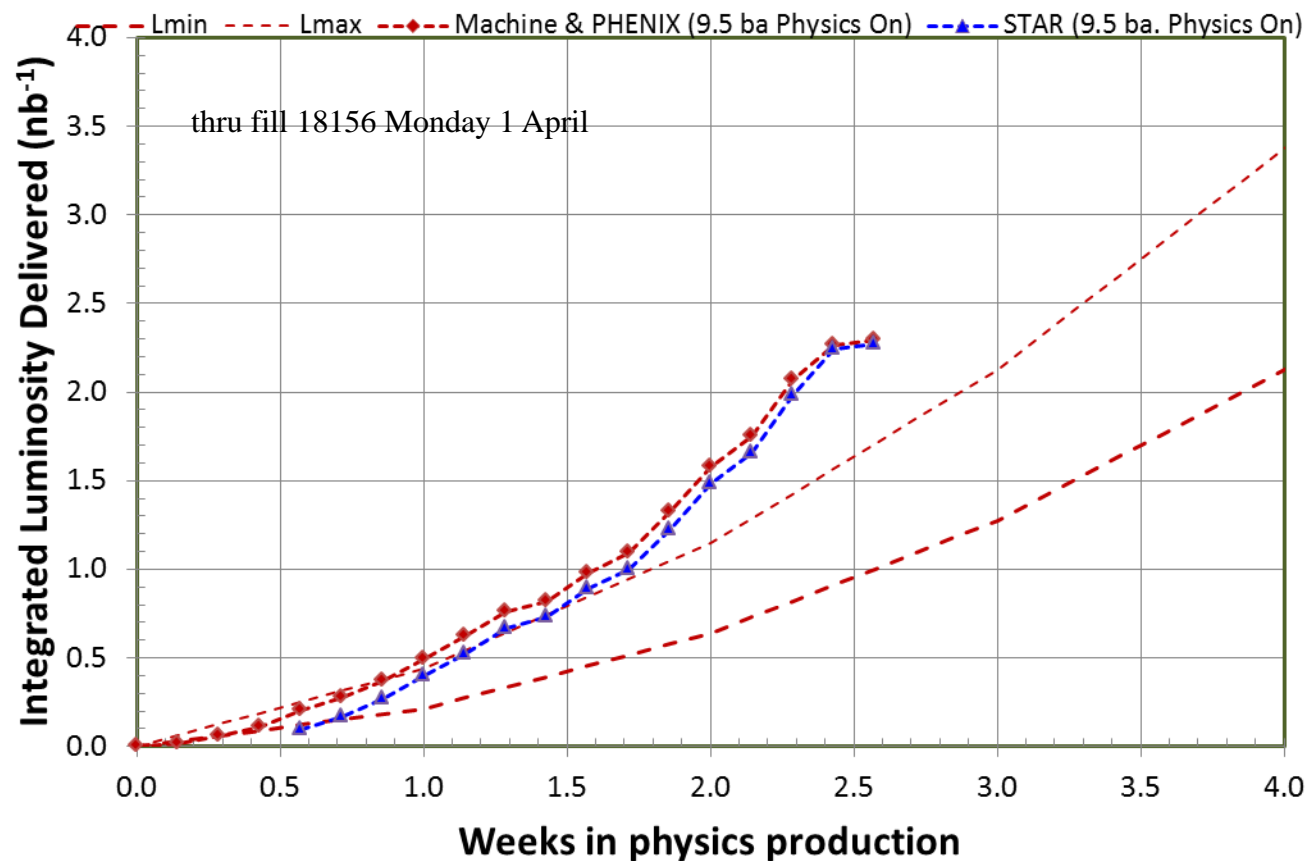
- ✓ 3 Feb, Begin cool-down to 4.5K
- ✓ 4 Feb, Cool-down to 6K in Blue
- ✓ 7 Feb, Blue and Yellow at 4.5 deg K
- ✓ 10-Feb, Beam in Blue and Yellow at injection
- ✓ 15-Feb, Begin √s = 14.6 GeV/n AuAu physics
- ✓ ~~8~~ ~~10~~ 11 Mar (Tuesday, 0800), End √s = 14.6 GeV/n AuAu physics run begin setup for √s = 200 GeV/n AuAu
- ✓ 15-Mar (~14:00, store 18046), Begin √s = 200 GeV/n AuAu physics run
    - ✓ PHENIX 1st physics store = 18046 (15 March)
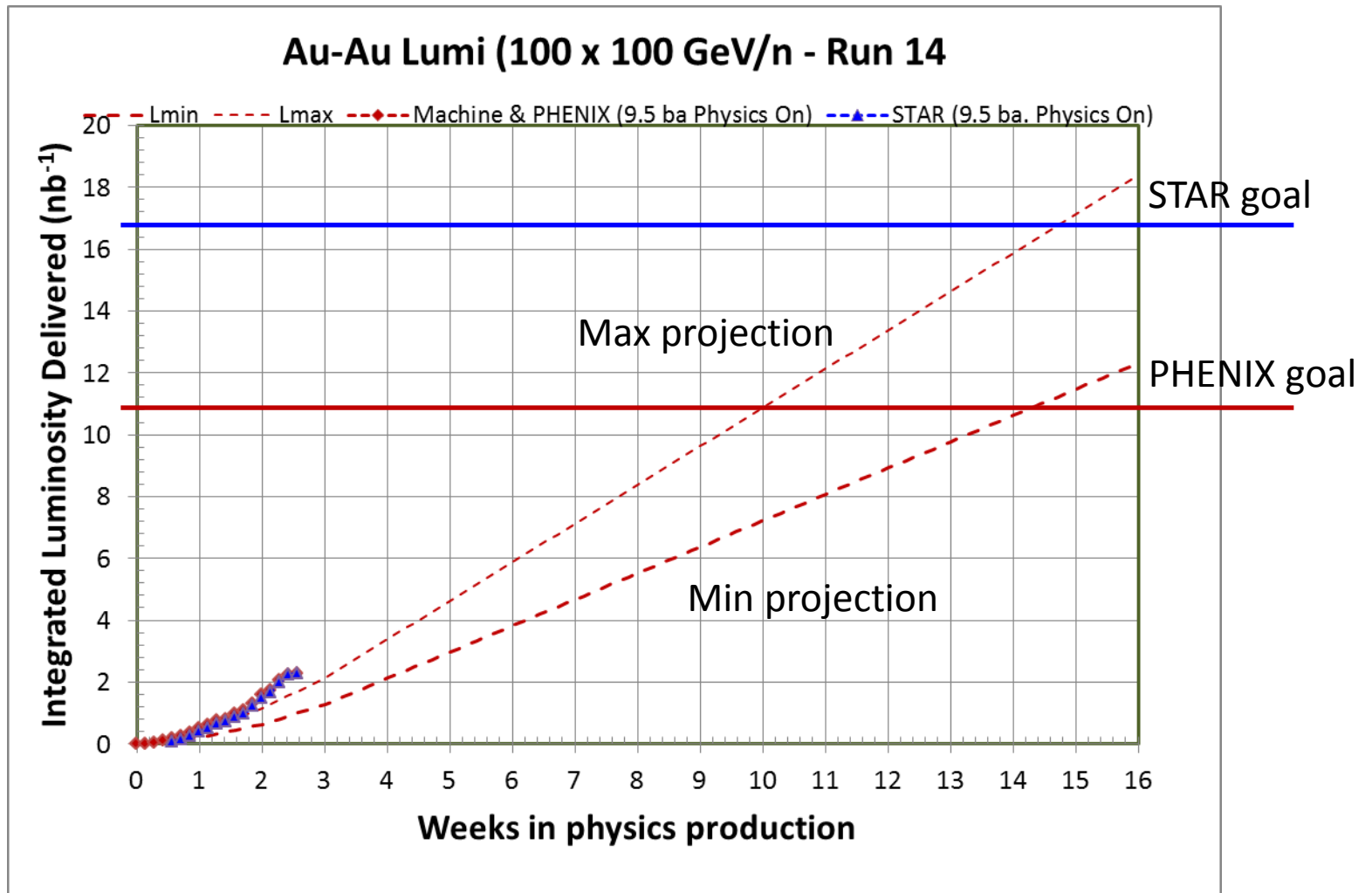   - ✓ STAR 1st physics store = 18064 (17 March)

today, 1 Apr…

- 27-Jun, End 15 week √s = 200 GeV/n AuAu run
- 27-June through 4 July , 7 days contingency/TBD
- 4-July, begin cryo warm-up
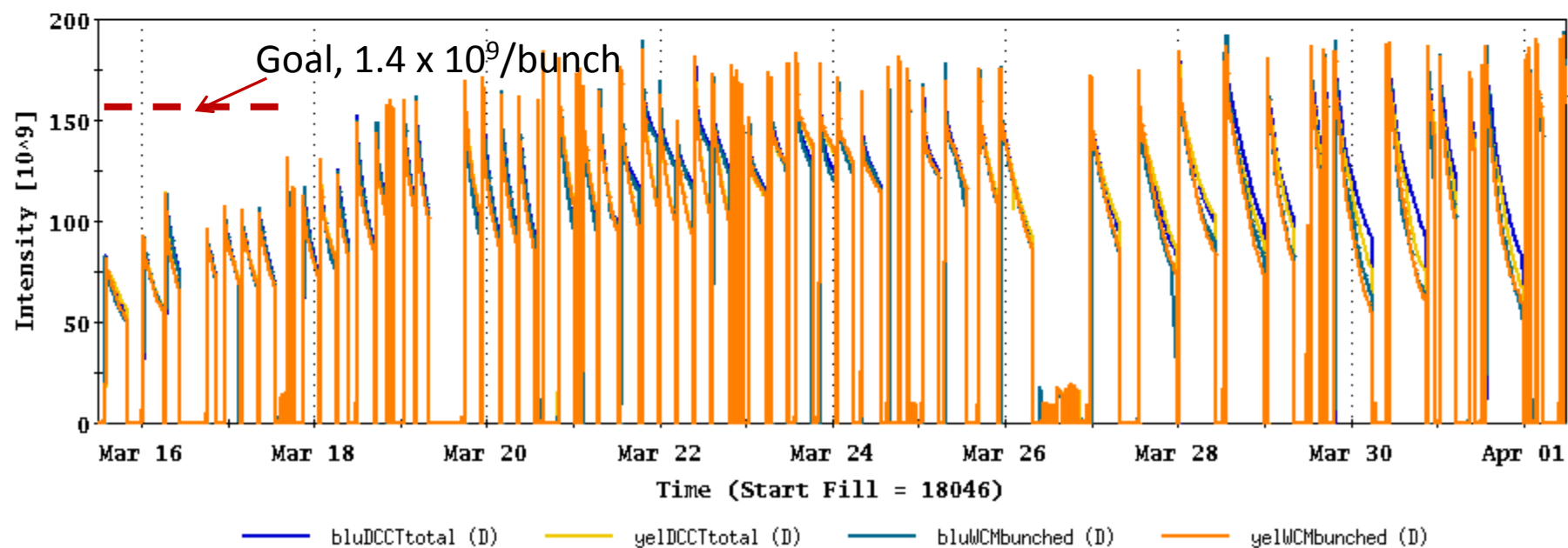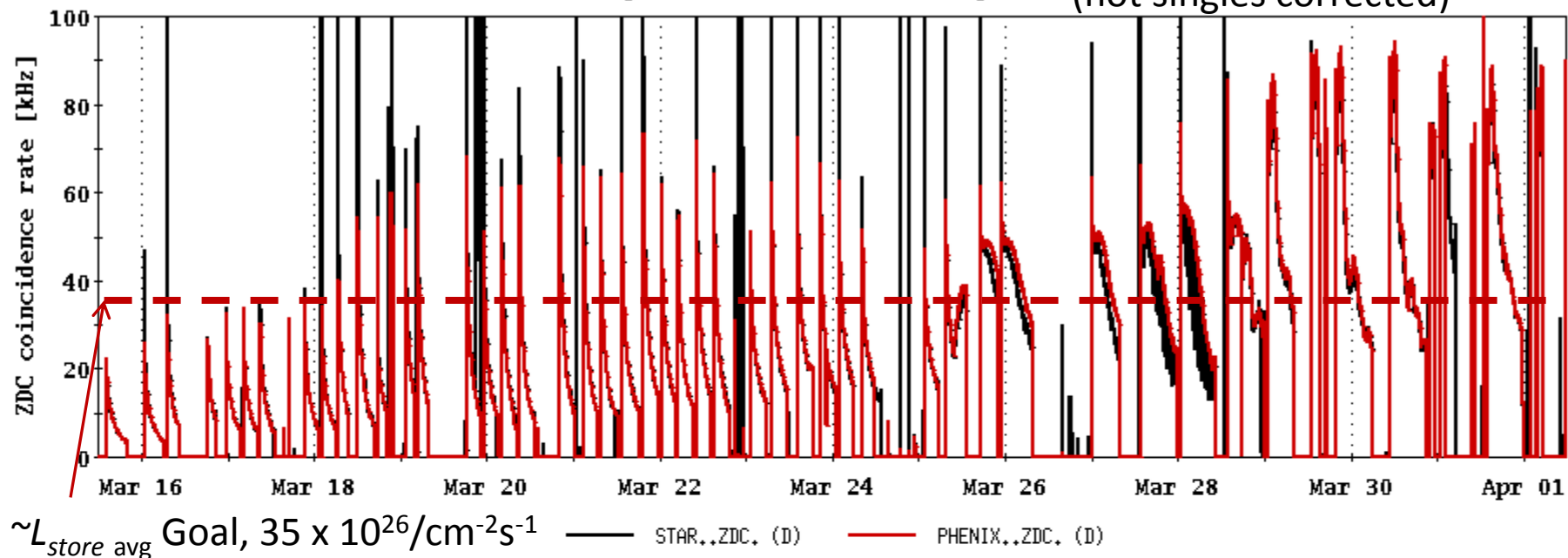- 7- July, warm-up complete, 22.0 cryo weeks of operation

See http://www.rhichome.bnl.gov/AP/RHIC2014/ for the Run Coordinator's detailed plan

Au-Au Lumi (100 x 100 GeV/n) - Run 14

thru fill 18156 Monday 1 April

Legend: Lmin, Lmax, Machine & PHENIX (9.5 ba Physics On), STAR (9.5 ba. Physics On)

Y-axis: Integrated Luminosity Delivered (nb^{-1})

X-axis: Weeks in physics production

Au-Au Lumi (100 x 100 GeV/n - Run 14

Fischer et. al. "RHIC Collider Projections (FY 2014 – FY 2018)", 4 June 2013

Experimental Coincidence Signals (not singles corrected)

~$L_{store\ avg}$ Goal, 35 x 10^{26}/cm^{-2}s^{-1} — STAR..ZDC. (D) — PHENIX..ZDC. (D)

Goal, 1.4 x 10^9/bunch

Time (Start Fill = 18046)

— bluDCCTtotal (D) — yelDCCTtotal (D) — bluWCMbunched (D) — yelWCMbunched (D)
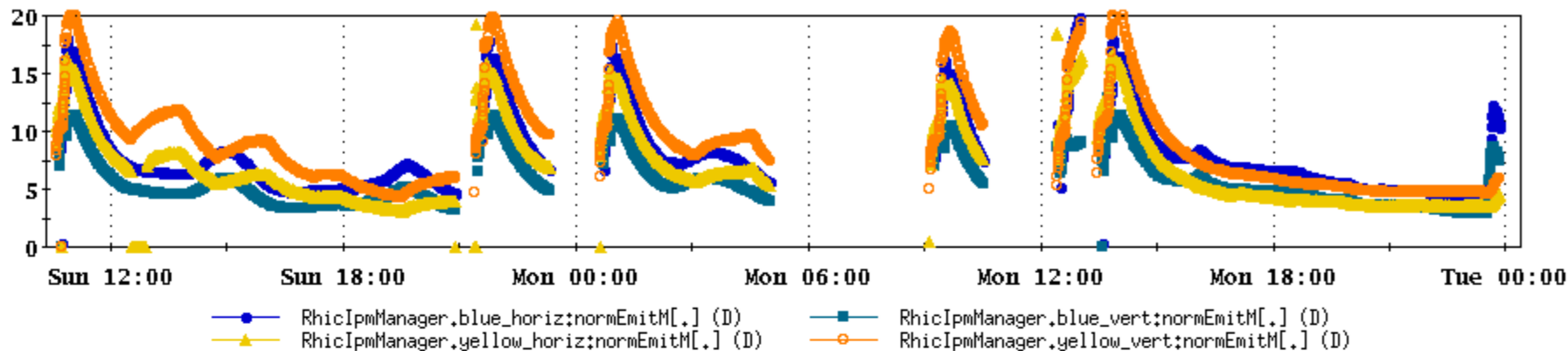
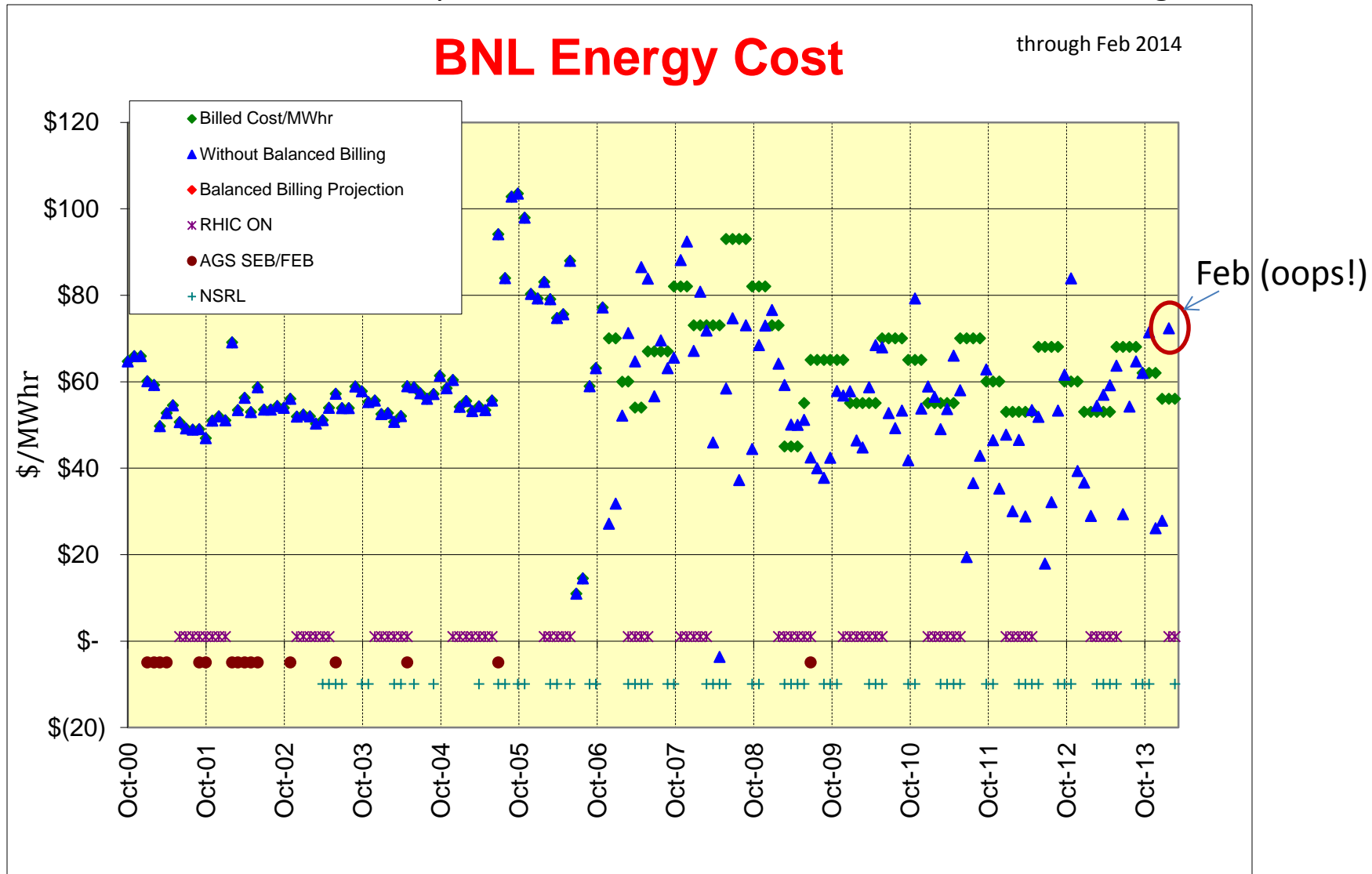30 Mar, Store 18145, 9 hr 59 min, 0.143 nb^{-1}
(40 x 10^{26} cm^{-2}s^{-1}) to PHENIX (assumes 9.5 b xscetion)

31 Mar, Store 18151, 9 hr 49 min, 0.149 nb^{-1}
(42 x 10^{26} cm^{-2}s^{-1}) to PHENIX

Store 18151
~best store

(Not singles corrected)
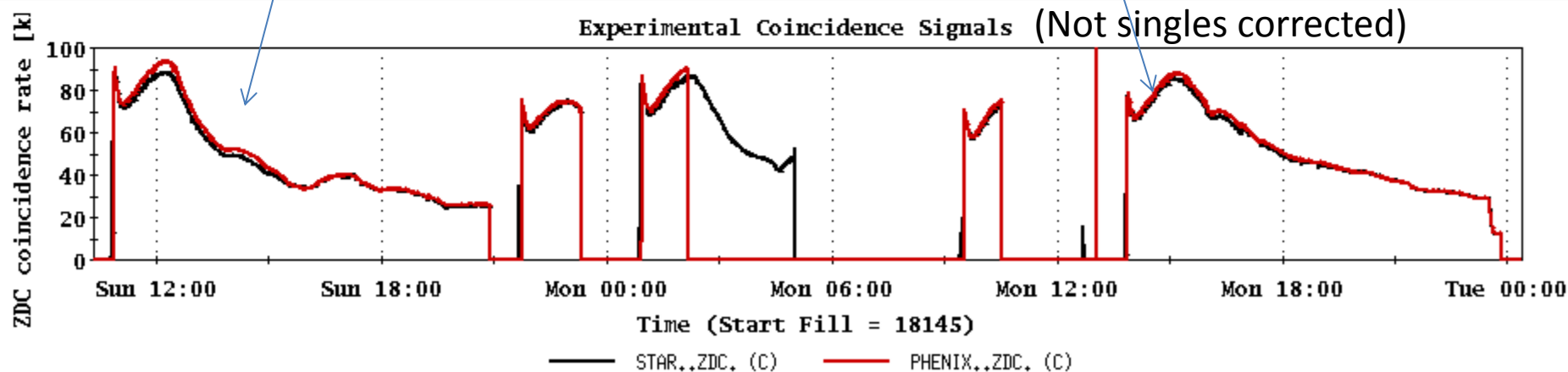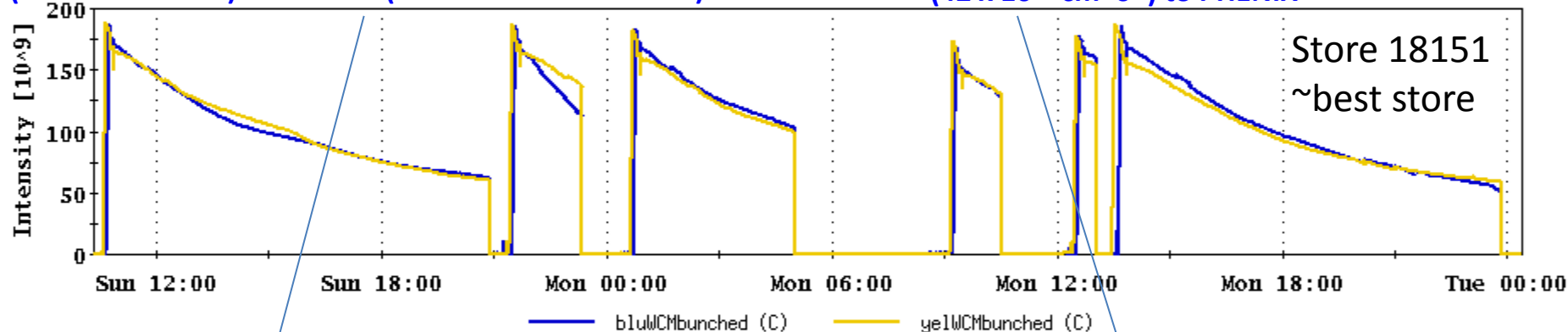
Archive

FY 2014 power rebate $ in BNL bank = $0.628M, through Feb

BNL Energy Cost

through Feb 2014

Legend:
- Billed Cost/MWhr
- Without Balanced Billing
- Balanced Billing Projection
- RHIC ON
- AGS SEB/FEB
- NSRL

Feb (oops!)
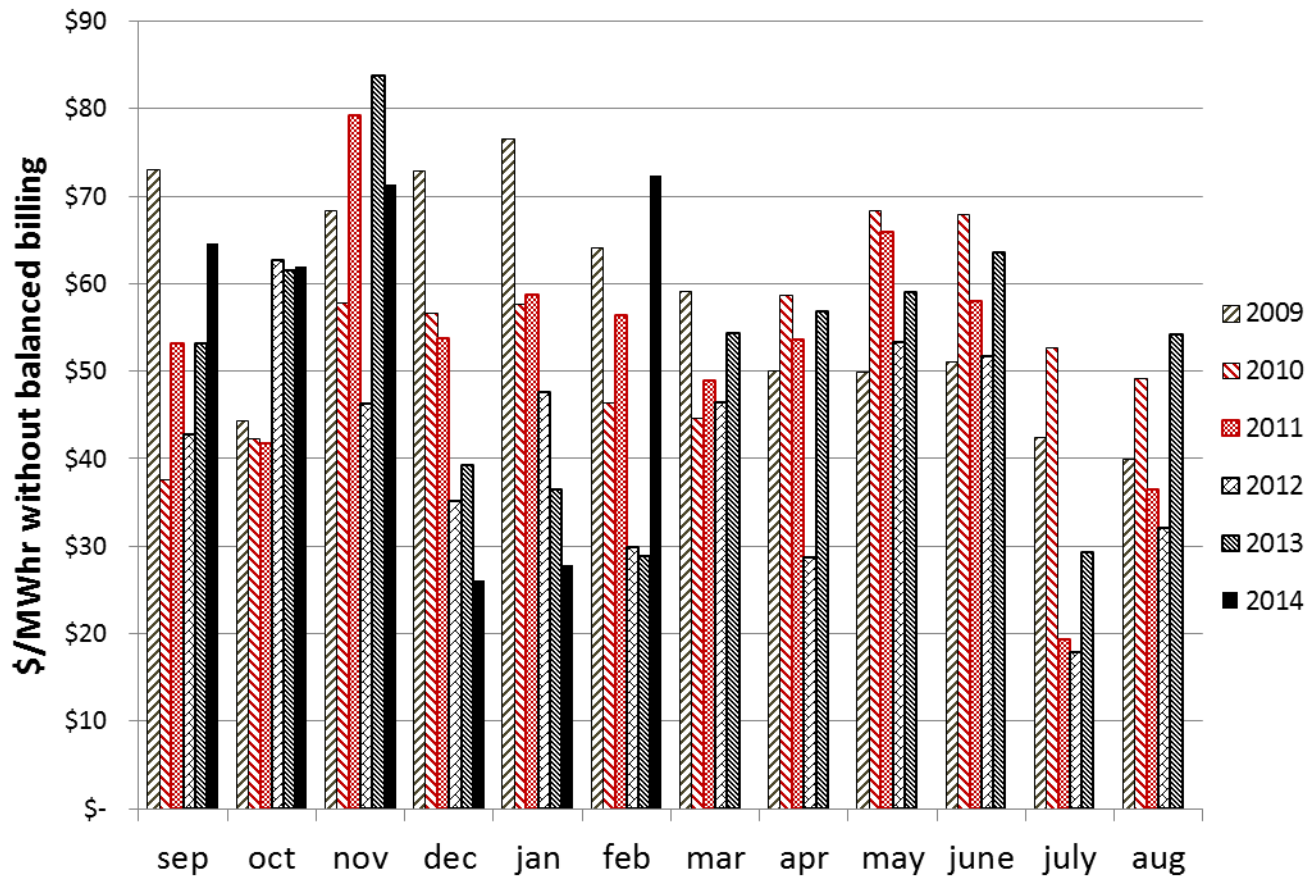
Goals for Run 14 (based on Beam Use Requests)
(11 Feb, DRAFT, to be updated by experiments)

PHENIX
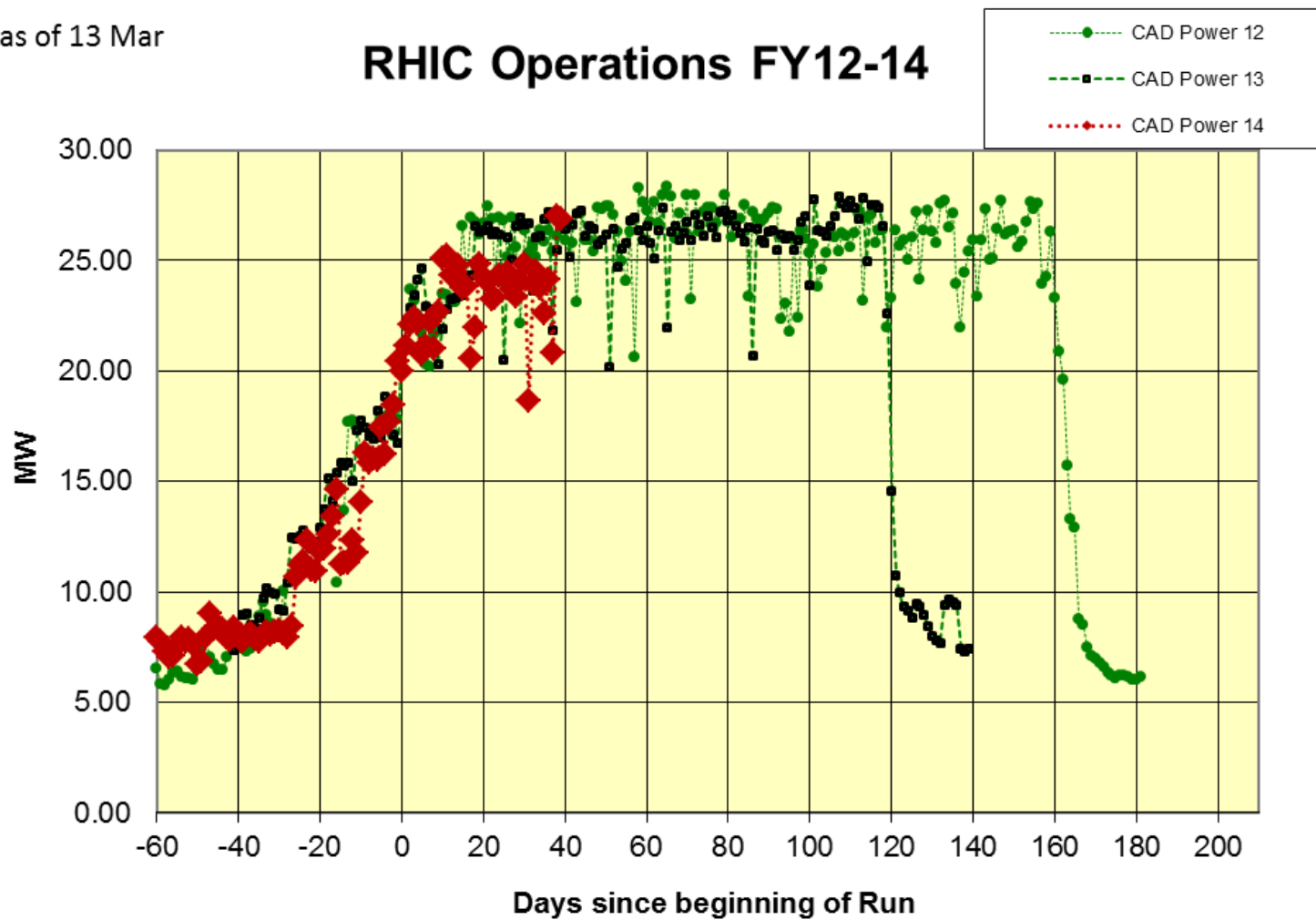- Au+Au @ 200 GeV for 12 weeks, L = 1.5 nb^{-1} sampled luminosity within |z| < 10 cm]
  - ➤ ~30% within |z| < 10 cm]
  - ➤ ~90% DAQ efficiency
  - ➤ ~50% bandwidth, DAQ saturation factor (?)
  - → 11 nb^{-1} delivered

STAR
- Au+Au @ 200 GeV for 14 weeks, L= 10 nb^{-1} recorded, 10^9 min bias triggers within |z| < 5 cm] → (2×10^9 triggers required)
  - ➤ ~ 60% (should be better) sampling efficiency
  - → 16.7 nb^{-1} delivered
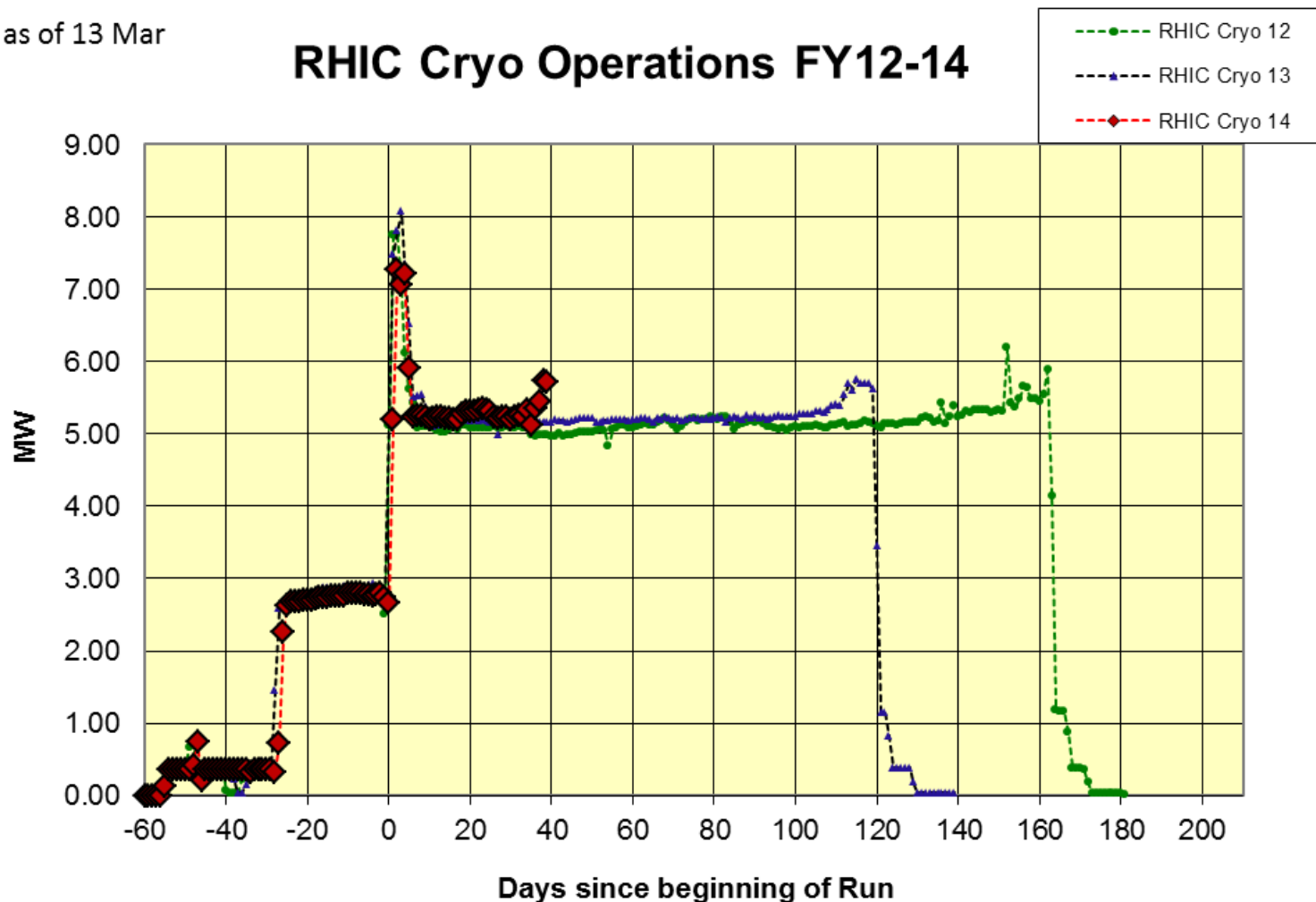
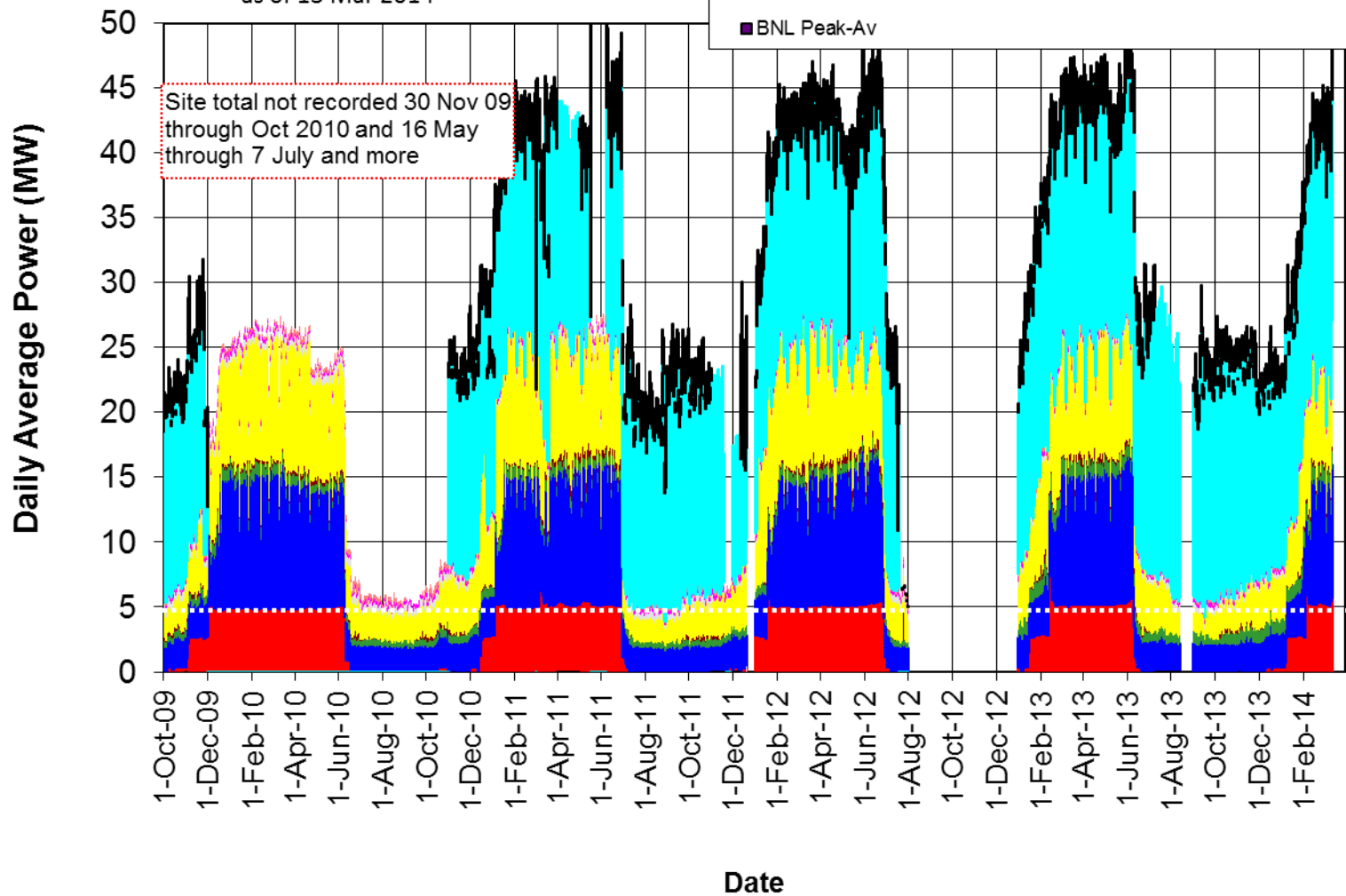- Au+Au @ 15 GeV for 3 weeks, 150M min bias triggers

RHIC Operations FY12-14

as of 13 Mar

Legend:
- CAD Power 12
- CAD Power 13
- CAD Power 14

MW vs. Days since beginning of Run

BNL Energy Use FY 2010-14

as of 13 Mar 2014

Site total not recorded 30 Nov 09 through Oct 2010 and 16 May through 7 July and more

Legend:
- RHIC Cryo
- RHIC other
- AGS-Exp
- Booster
- AGS-Mach
- Tandem
- CAD Bldg less SMD
- NSRL
- Site Base
- BNL Peak-Av

Y-axis: Daily Average Power (MW) — 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50

X-axis (Date): 1-Oct-09, 1-Dec-09, 1-Feb-10, 1-Apr-10, 1-Jun-10, 1-Aug-10, 1-Oct-10, 1-Dec-10, 1-Feb-11, 1-Apr-11, 1-Jun-11, 1-Aug-11, 1-Oct-11, 1-Dec-11, 1-Feb-12, 1-Apr-12, 1-Jun-12, 1-Aug-12, 1-Oct-12, 1-Dec-12, 1-Feb-13, 1-Apr-13, 1-Jun-13, 1-Aug-13, 1-Oct-13, 1-Dec-13, 1-Feb-14

C-AD Energy Use FY 2002-14

as of 13 Mar 2013

**Integrated Luminosity
Run14   7.3GeV Au x 7.3 GeV Au**

Note: 3.7 ba collision cross section

- PHENIX integrated lumi
- STAR integrated lumi
- Min projection
- Max projection

Integrated Luminosity [μb^{-1}]

Time in Physics [weeks]

From Ingrassia,
http://www.cadops.bnl.gov/AGS/Operations/Run14/

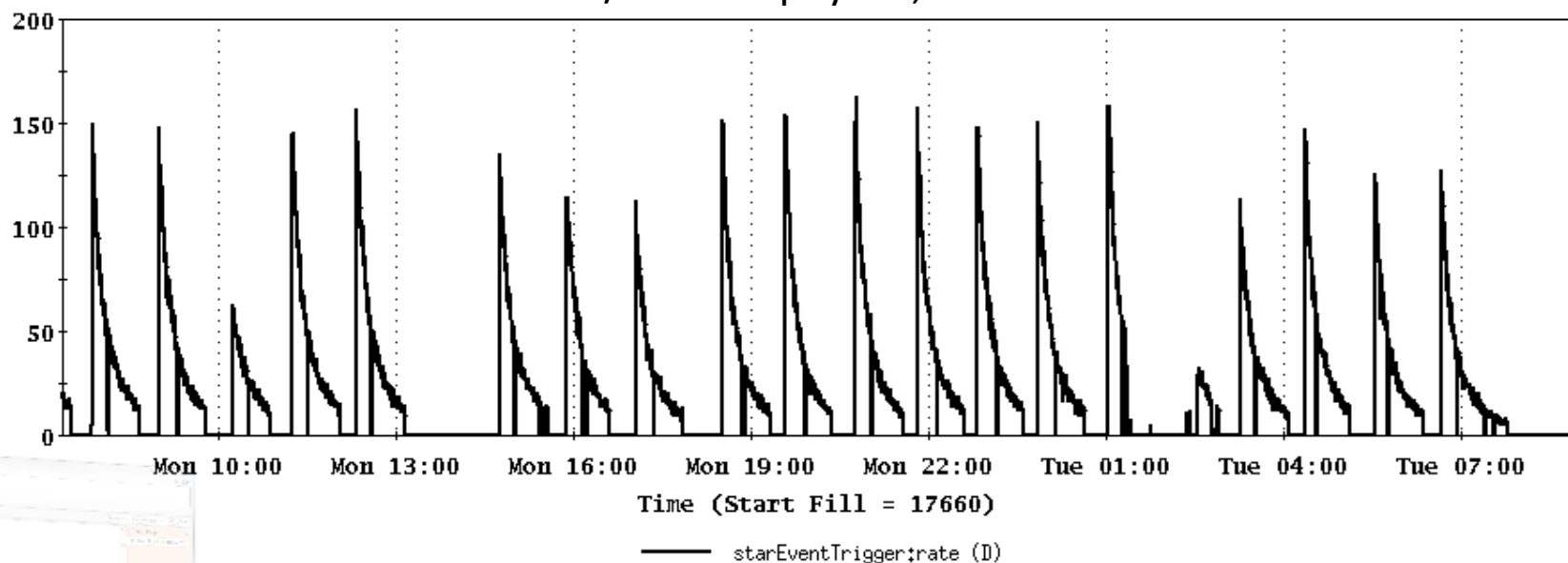√s = 14.6 GeV/n AuAu physics, 15 Feb-11 Mar

File   Window   Markers   Analysis
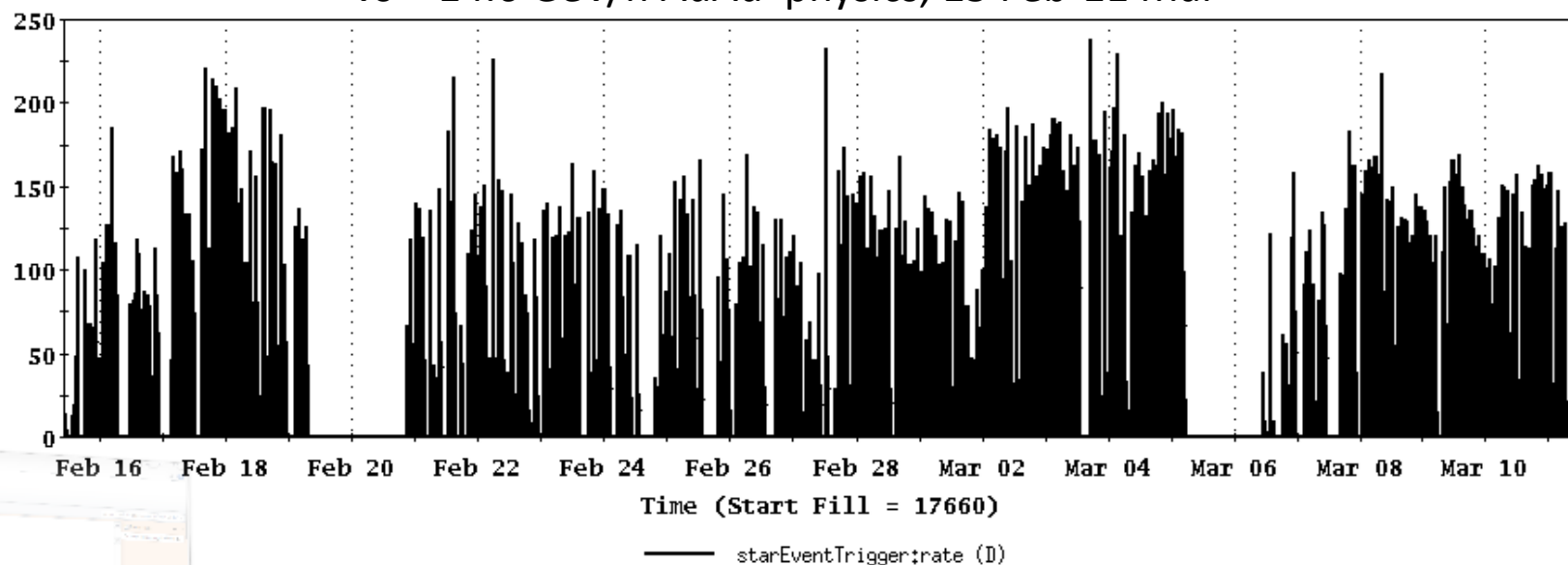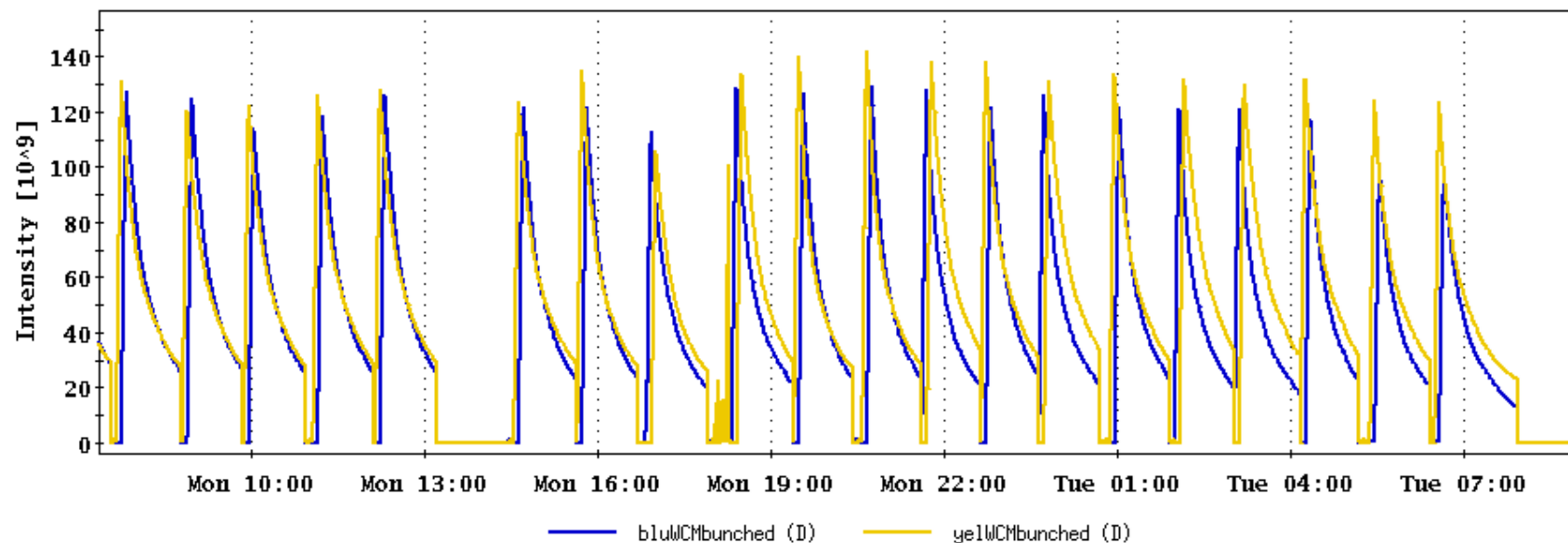
√s = 14.6 GeV/n AuAu physics, last 24 hours

C-A Operations-FY14

4 Mar 14

Scheduling Physicist: Chuyu Liu

planned, budget permitting

Legend:
- concurrent with RHIC
- setup with beams
- ramp up luminosity

FY 2014

Program Element	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
AGS-Booster-Tandem/Linac/EBIS Startup		■		■	■								
RHIC Cryo Cooldown to 45 deg K							22.0 weeks				7 July		
RHIC Cryo Cooldown/Warm-up					3 Feb								
RHIC Cryo Operation													
RHIC Cryo off													
RHIC STAR & PHENIX													
RHIC Research with √s = 200 GeV/n AuAu					15 Feb		15 weeks						
RHIC Research with √s = 15 GeV/n AuAu						3 wks	10 Mar				4 July		
Contingency/other beams													
Particle Accelerator Conference (IPAC)													
NSRL (NASA Radiobiology)		7 Oct 13C	15 Nov				25 Mar / 31 Mar 14A	16 May / TBD 14B			TBD		
NSRL (NRO)		18 Nov	22 Nov				29 Mar				TBD		
BLIP (Isotopes)				17 Dec									
BLIP (other)													
Shutdown (RHIC)													

Table 2: Maximum luminosities that can be reached after a sufficiently long running period. The beam energy is stated. Other ion combinations can be estimated on demand. For species combinations not yet run the minimum luminosities are approximately 50% of the maximum.

Mode	Beam energy [GeV/n]	No of colliding bunches	Ions/bunch [10^9]	β^* [m]	Emittance [mm]	L_{peak} [cm^{-2}s^{-1}]	$L_{store\ avg}$ [cm^{-2}s^{-1}]	L_{week}
Pb-Pb	98.3	111	1.1	0.7	23→8	20×10^{26}	17×10^{26}	0.6 nb^{-1}
Au-Au	100	111	1.4	0.7	23→8	40×10^{26}	35×10^{26}	1.2 nb^{-1}
h-Au ★	100	111	20 / 1.3	0.8	20→23	8×10^{28}	5×10^{28}	16 nb^{-1}
d-Au ★	100	111	110 / 1.4	0.8	17→25	47×10^{28}	28×10^{28}	95 nb^{-1}
p↑-C	100	111	180 / 20	0.8	18→23	10×10^{32}	7×10^{32}	2.3 pb^{-1}
p↑-Cu	100	111	180 / 4.0	0.8	18→23	200×10^{28}	150×10^{28}	475 nb^{-1}
p↑-Au	100	111	180 / 1.4	0.8	18→23	70×10^{28}	50×10^{28}	165 nb^{-1}
p↑-p↑ *	100	107	160	0.85	17→25	65×10^{30}	38×10^{30}	14 pb^{-1}
p↑-p↑ *	255	107	200	0.65	20→25	280×10^{30}	170×10^{30}	56 pb^{-1}

★ h (helion) – nucleus of the ^{3}He atom; d (deuteron) – nucleus of the ^{2}H atom; p (proton) – nucleus of the ^{1}H atom.
* We expect that an intensity- and time-averaged store polarization P of up to 65%, as measured by the H jet, can be reached at 100 GeV. At 255 GeV we expect the polarization P to reach up to 57%. In Run-11 PHENIX had 107 and STAR 102 colliding bunches.
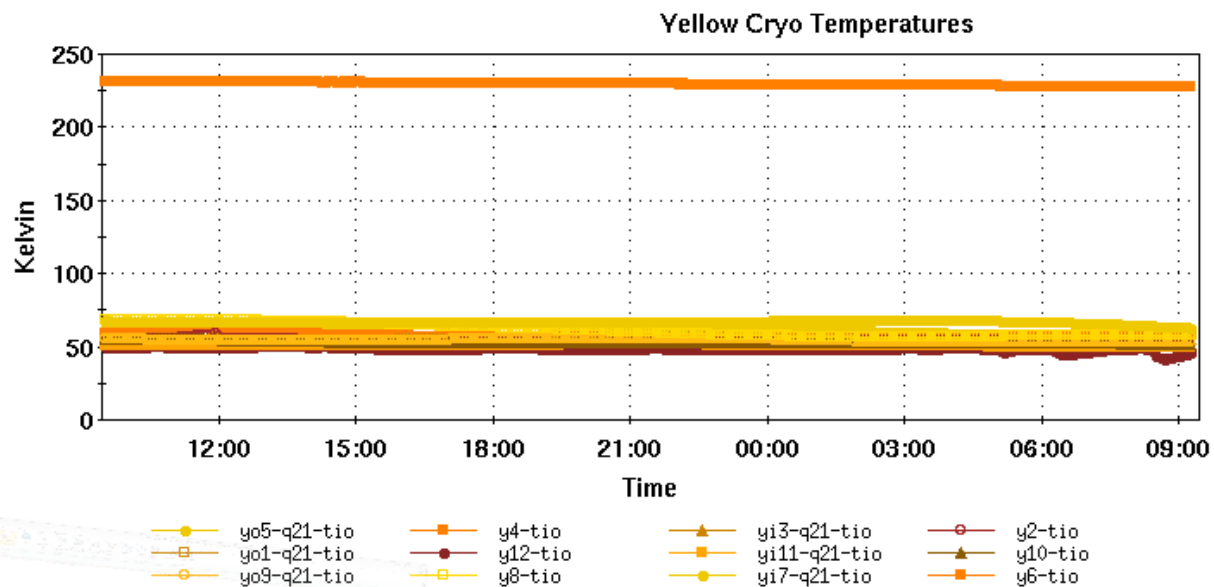
Fischer et. al. "RHIC Collider Projections (FY 2014 – FY 2018)", 4 June 2013
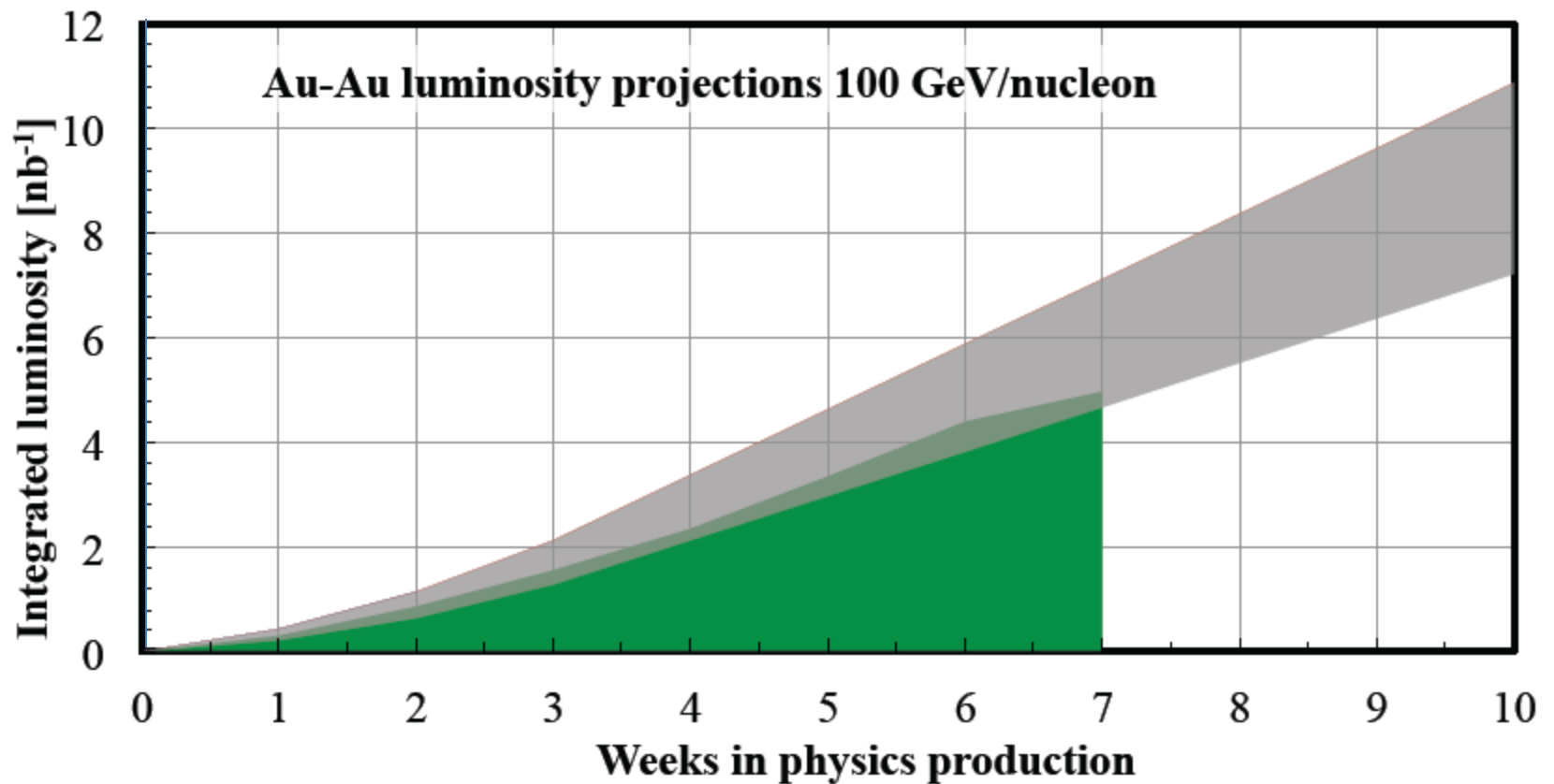
Figure 4: Projected minimum and maximum integrated luminosities for Au-Au at 100 GeV/nucleon.

Fischer et. Al. "RHIC Collider Projections (FY 2014 – FY 2018)", 4 June 2013
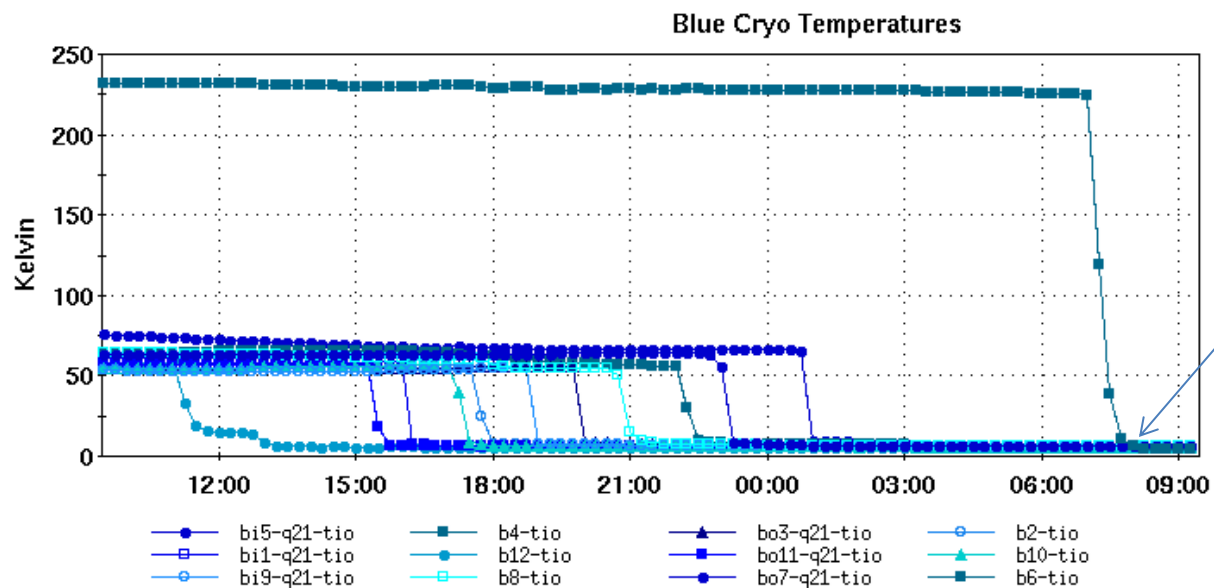
4 Feb 2014

Blue at 4.5 deg

7 Feb 2014, Blue and Yellow at 4.5 deg K
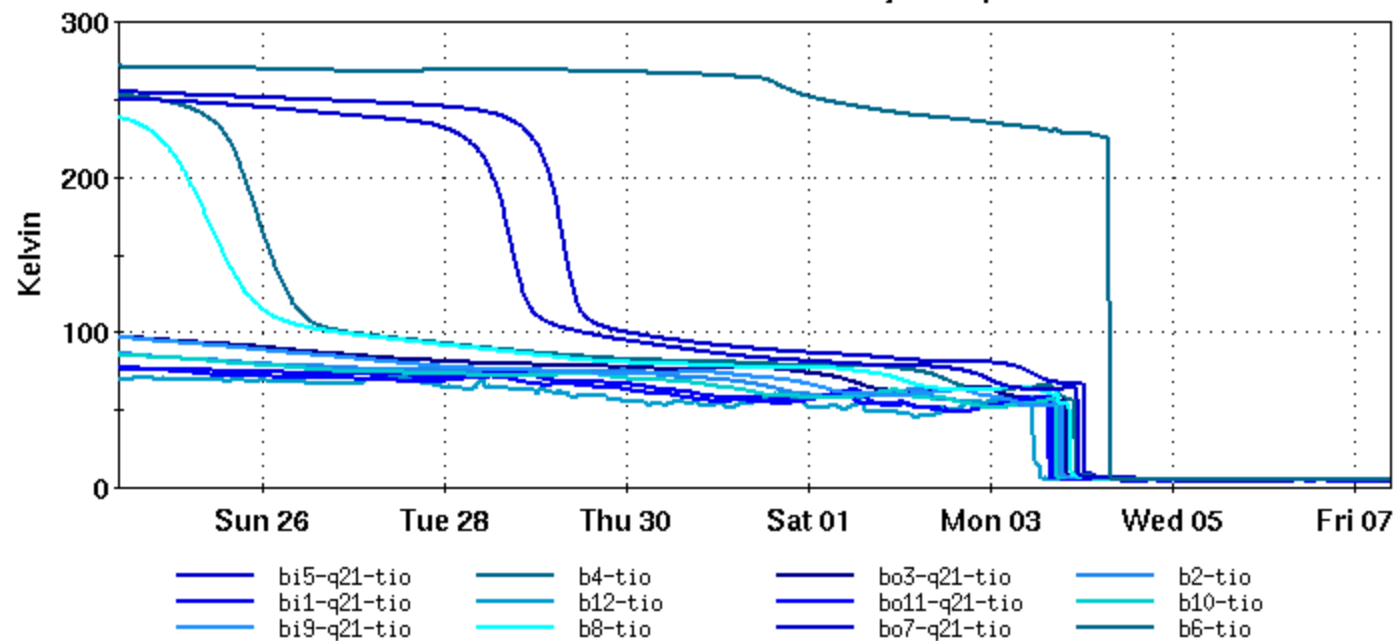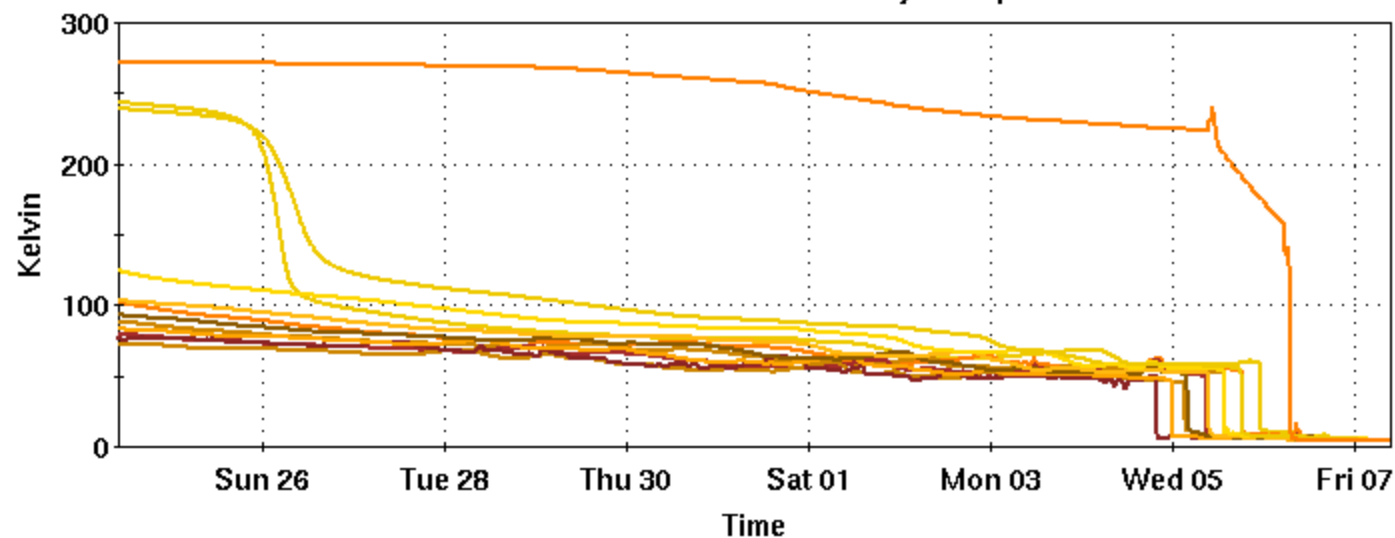
For example, 20 weeks of RHIC refrigerator operation in FY 2014 could be scheduled in the following way:

Cool-down from 50 K to 4 K	1 week	
Set-up mode 1 (Au-Au at 7.5 GeV/nucleon)	1 week	(no dedicated time for experiments)
Ramp-up mode 1	½ weeks	(8 h/night for experiments)
Data taking mode 1	2 ½ weeks	
Set-up mode 2 (Au-Au at 100 GeV/nucleon)	½ week	(no dedicated time for experiments)
Data taking mode 2 with further ramp-up	10 weeks	
Set-up mode 3 (p↑-p↑ at 100 GeV)	1 week	(no dedicated time for experiments)
Ramp-up mode 3	½ weeks	(8 h/night for experiments)
Data taking mode 3+1 with further ramp-up	2 ½ weeks	
Warm-up	½ week	

From Fischer et. al., RHIC Collider Projections (FY 2014 – FY 2018), 4 June 2013

Who's Who for 2014

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AGS liaison:	Haixin Huang	huanghai@bnl.gov	631-344-5446 (office)